ENGINEERING NEWS

Tribune Building, New York City.

GEO. H. FROST, PROPRIETOR.

SATURDAY, JUNE 4, 1881.

THERE is every indication of a very large attendance upon the coming Convention at Montreal. Secretary Bogart is "up to the eyes" in business, and a delightful reunion may be expected.

THE French tax on dynamite is 2 francs per kilogramme. It is expected however, now that dynamite has not diminished the use of powder, from which the government received a large revenue, that the tax will be made lighter. 600,000 kilogrammes are now used in France.

EVEN Bismarck's protective proclivities do not discourage English contractors from applying for "concessions" in Germany. The London firm of Wellers, Owen & Elwens have asked for permission to build a harbor at Gluckstadt, a small place on the Elbe, between Hamburg and Cuxhaven. This is the first step toward making a canal from that town to Kiel. The docks would cost six million marks.

GEN. W. SOOY SMITH, Chief Engineer of the Hudson River Tunnel, just returned from Europe, has favored the people of Chicago with some valuable hints on street paving, and thinks that it is not necessary to abandon the wood pavements which have been so popular in that city. Gen. Smith gives the practice in London as a substratum of concrete, about four inches thick, in a bed of sand; then to lay the blocks in asphaltum and fill in the spaces with more concrete. The wood is solid and well seasoned. Gen. Smith says the approach to London Bridge, which sustains a larger amount of travel than any other spot in the world, and is paved after this fashion, has been in use during the past four years, and shows small signs of wear.

AMERICAN SOCIETY OF CIVIL ENGINEERS, 1881-1882.

OFFICERS.

James B. Francis—President.

O. Chanute, Ashbel Welch—Vice-Presidents.

John Bogart—Secretary and Librarian.

J. James R. Croes—Treasurer.

William H. Paine, C. Vandervoort Smith, Joseph P. Davis, G. Bouscaren, D. J. Whittemore—Directors.

STANDING COMMITTEES.

On Finance.—William H. Paine, C. Vandervoort Smith, Joseph P. Davis.

On Library.—J. James R. Croes, O. Chanute, Ashbel Welch.

Regular meetings at 8 p. m. on the first and third Wednesdays of each month, except July and August.

The house of the Society is open from 9 a. m. to 5 p. m. each business day except Saturday, when it is closed at 3 p. m.

The library and conversation rooms are also open every Wednesday evening from 7½ to 10 o'clock.

Thirteenth Annual Convention.—Montreal, Canada, June 15, 1881.

Twenty-ninth Annual Meeting.—New York, January 18, 1882, at 10 a. m.

House of the Society.—127 East Twenty-third street, New York.

At the regular meeting of the Society on Wednesday evening, Vice-President Ashbel Welch occupied the chair. The following were elected members:

Jacob Blickensderfer, Chief Engineer Union Pacific Railway, Omaha, Neb.

Robert Blickensderfer, Div. Engineer Utah & Northern Railway; Terminus, Montana.

Cabell Breckinridge, Engineer Alabama Great Southern Railroad, Chattanooga, Tenn.

Stephen S. Haight, Asst. Engineer Dept. Public Parks, New York City, N. Y.

Wm. Pond Harris, Managing Director New York & Greenwood Lake Railway, Jersey City, N. J.

FOR JUNIOR.

Hunter Stewart, U. S. Asst. Engineer, St. Louis, Mo.

The Secretary stated that $12,000 had been subscribed to the Building Fund. The Secretary also read the programme of the Montreal Convention, a synopsis of which we give elsewhere. The subject of Quicksand in Excavation was discussed by Wm. R. Hutton (by letter), and by Messrs. E. S. Chesbrough, Wm. Sooy Smith, Ashbel Welch, Charles Macdonald, Joseph P. Davis and J. E. Streidinger.

CONVENTION NOTES.

The following members of the American Society of Civil Engineers and invited guests will meet at Niagara Falls on the 11th: Jas. B. Francis, of Lowell, Mass., President of the Society, and Mrs. Francis; Ashbel Welch, Lambertville, N. J., Vice-President of the Society; and the Misses Welch; John Bogart, Secretary of the Society, New York City, and Mrs. Bogart; A. Bonzano, Chief Engineer Phœnixville Bridge Works, Phœnixville, Pa., and Mrs. Bonzano and Master Bonzano; Wm. E. Worthen and Mrs. Worthen, New York City; C. Shaler Smith, President Baltimore Bridge Company, St. Louis, Mo.; H. G. Wightman, City Engineer, Boston, Mass.; Jno. W. Bacon, Railroad Commissioner, Danbury, Conn.; Mrs. and Miss Bacon and Master Bacon; C. C. Martin, First Assistant Engineer, East River Bridge, and Miss Martin; Louis H. Knapp, City Engineer, Buffalo; Arthur Spielmann, Hoboken, N. J.; Chas. F. Brush, Hoboken, N. J.; James Archbald, Chief Engineer D., L. & W. R. R., Scranton, Pa.; Prof. Robert Fletcher, Thayer School of Engineering, Hanover, N. H.; Prof. A. J. DuBois, and Mrs. DuBois, Sheffield Scientific School, New Haven, Conn.; Prof. Mansfield Merriman, Lehigh University, Bethlehem, Pa.; H. G. Morris, Mrs. and Miss Morris, Philadelphia, Pa.; Chas. A. Ferry and Mrs. Ferry, New Haven, Conn.; E. W. Bowditch, Boston, Mass.; D. Bouticou, New York; Marshall Morris, Louisville, Ky.; Robert McMath, St. Louis, Mo.; R. L. Read and Mrs. Read, Cincinnati, O.; D. McN. Stauffer, Boston, Mass.; Prof. Chas. A. Smith, St. Louis, Mo.; F. Slataper, Ch. Engineer Penn. R. R., Pittsburgh, Pa., and Mrs. Slataper; Bryant Godwin, New York; Edward Hemberle, Resident Engineer Delaware Bridge Co., Chicago, Ill.; B. D. Hasell, N. Y. City; H. G. Prout, 12 Barclay st., N. Y. City; L. M. Johnson, Pullman Car Co., Chicago; Wm. H. Lotz, Chicago; Thos. D. Lovett, Cincinnati, O. Chas. Latimer, Cleveland, O.; G. Y. Wisner and Mrs. Wisner, of St. Louis, Mo.; Wm. B. Knight, Kansas City, Mo.; E. L. Corthell, N. Egremont, Mass.

Up to noon yesterday the following have signified their intention of being present at the Convention: E. R. Andrews, New York City; H. A. Bentley, Newport, R. I.; E. S. Chesbrough and Mrs. Chesbrough, Chicago; C. H. McKee, Albany; Jas. Owen, Newark, N. J.; McRae Swift, New Brunswick, N. J.; A. S. C. Wurtele, Albany; John W. Weston, Chicago, Ill.; P. A. Peterson, Montreal; Geo. D. Ansley, City Engineer, Montreal; Jos. R. Richards and Mrs. Richards, of Boston; M. M. Tid, Boston; Rudolph Hering, Mrs. Hering and Miss Gregory, Philadelphia; Chas. E. Fowler, New Haven, Conn.

Parties from the East will leave New York for Niagara Falls by the 6 p. m. train Friday the 10th, and will leave Toronto Monday afternoon by steamer, passing the Thousand Islands between 8 and 11 a. m. Tuesday, and the Rapids of the St. Lawrence in the afternoon, arriving at Montreal by 7 p. m.

The Chicago *Tribune*, of recent date, has the following from a correspondent:

"The journey through the Upper St. Lawrence amidst that wonderful collection of islands known as "The Thousand Islands," if not a novelty to the traveler is one which by reason of its endless variety never becomes tiresome. These islands consist of about 1,800 woody and rocky islets of every imaginable shape, size and appearance; some being "mere dots of rock a few yards in extent, others covering acres, thickly wooded, and presenting the most charming appearance of rich foliage conceivable." As is well known many exciting scenes took place here during the insurrection of 1837. In these labyrinthine by-ways between the islands the active insurgents and their American sympathizers found shelter and baffled the pursuit of their enemies.

"'The Thousand Isles, the Thousand Isles,
Dimpled the wave around them smiles,
Kissed by a thousand red-lipped flowers,
Gemmed by a thousand emerald bowers,
A thousand birds their praises wake,
By rocky glade and plumy brake,
A thousand cedars' fragrant shade
Falls where the Indinn's children played;
And fancy's dream my heart beguiles
While singing thee, the Thousand Isles.'

"The poetry of this quotation is not remarkable in quality, but the sentiments are appropriate, so I cite them here."

The programme in Montreal embraces a reception in Molson Hall, McGill University, and a business meeting on Wednesday a. m.; a drive to Mountain Park; a garden party at Terrace Bank, the residence of Mrs. Redpath, and a session for reading papers, in the afternoon and evening; an excursion to Ottawa City, the capital of the Dominion, to see the saw mills, timber slides, waterworks, Parliament buildings, Chaudiere Falls, etc., and return to Montreal, will occupy the 16th till 9 p. m., after which there will be a session for reading papers; the 17th will be spent on an excursion about Montreal Harbor, with lunch on board the steamer; a visit to an Allan steamship, to the Victoria Bridge, Lachine Canal, the water-works, G. T. R. machine shops, etc., with session in the morning. On Saturday there will be a session in the morning, and an exhibition of the Fire Brigade in the afternoon.

Trains for New York and Boston leave Montreal at 3.20 p. m., arriving at New York at 7 a. m. next day. Boats and trains to Quebec and the West leave in the evening.

There are a number of objects to interest the new comer in Montreal. The city itself is a novelty to parties accustomed to the broad streets and modern buildings of American cities; the Cathedral, with its big bell, is worth a visit; the nunneries and other Roman Catholic institutions are remarkable for their size and numbers; Bonsecour Market is one of the largest market buildings on the continent, and stands close to the fine dock wall, which is unsurpassed on this side of the Atlantic. The entire programme of travel and entertainment is unsurpassable in its variety and interesting features, and cannot fail to charm every one who attends the Convention.

WE will be present, as in former years it has been our pleasant privilege, at the Convention, and hope to renew the personal acquaintance of as many of our friends as possible. We wish to make as complete a report of the meetings and excursions as time and opportunity will permit, and we especially request the full names, addresses and present positions of every person attending the Convention, so as to be able to present a full and accurate list the week following the meeting. We will be present on the steamer from Toronto, and in Montreal at the Windsor, and we hope to make the personal acquaintance of every visitor. Our acquaintance among civil engineers has be-

come pretty extensive, and the more we meet the profession the better we like its members, whom we consider, as a class, the most intelligent and agreeable traveling companions that can be found anywhere.

MR. VENNOR, who is a Montrealer, and who, by-the-by, was a class-mate of ours in civil engineering in McGill University in 1859, "predicts" a wet June, with frequent severe wind and thunder storms, and probable frosts between the 5th and 10th of the month He says: "The 'north waters' are only coming down now, which is an indication of a wet June. The warmest part of June is likely to occur between the 20th and 25th, when the heat may be excessive." Visitors to the Convention need not expect to see snow in Canada at this season of the year. Montreal is a hot city in the summer time, but on account of the travel by water, and because the nights are cool, it will be advisable to be prepared therefor.

IN addition to the papers already announced to be read at Montreal, Prof. Thurston, of the Stevens Institute, will present one on "The Strength and Ductility of the Copper-Tin-Zinc Alloys;" Sandford Fleming, of Ottawa, Ont., on "Standard Time for Railroads and Telegraphs," and a paper on the "Improvement of Montreal Harbor," will be read by a non-member of the society.

THE RENSSELAER POLYTECHNIC INSTITUTE.

The commencement exercises of the Rensselaer Polytechnic Institute are to be held at Troy on the 12th, 13th, 14th and 15th, and we especially note a pleasing feature in this year's programme, as distinguished from the past, in the reception to the "Alumni and other friends of the Institute," to be given in Harmony Hall on the evening of the 14th. This, the oldest and the leading school of engineering in America, has thus far been able to hold its own, largely by the scarcity and poor equipment of other and similar institutions. This reason is rapidly lessening, and the excellence of the engineering schools attached to several of our prominent universities is now so well known that the Troy school will have to shake off some of its lethargy if it hopes to keep even pace with its more energetic competitors. One drawback to the Rensselaer has been its poverty; its friends and alumni are moving to obtain some endowments to overcome this difficulty; its poverty, combined with the very practical nature of its studies, has made it an extremely unsocial institution, so that it is really less known in Troy, where it has maintained its frigid existence for more than a quarter of a century, than it is in New York or other cities to which its graduates have taken their talents and energies, improved by the instruction of their Alma Mater, but with no social tie to bind them to it and entice them to its annual graduating exercises. This year has already been distinguished by the meeting of Alumni at the hospitable residence of the Hon. Clarkson N. Potter, which has been reported in this journal; the substitution of a reception—instead of a formal dinner—to which the people of Troy and other cities are invited, is another move to overcome the exclusiveness that has heretofore prevailed, and we doubt not that these "departures" are but the preludes of a more friendly and sociable era for this parent institution of Civil Engineering in America. The Hon. Clarkson N. Potter will address the students on the evening of the 15th, and it is pleasant to note the fact that the gentleman can be thus enticed away from business to lend the encouragement of his presence and words to the graduates, the Alumni and many friends of his own much respected Alma Mater.

THE WATER SUPPLY PROBLEM AGAIN.

The article on water supply, to which we called attention in a recent number of this paper, seems to have met with much favor. Letters from different sections of the country reach us almost every day asking for a copy of the pamphlet containing a reprint of it. This is a pleasing indication that the subject is becoming of more interest than we anticipated. So full, exhaustive, and interesting document upon the particular feature of which it treats has not been published in a long time, and the views expressed in it, coming as they do from professionals and non professionals; from those who supply water and those who consume it; and all agreeing without dissent upon what they believe is the only remedy for suppressing waste, makes the conclusions they have reached more than usually valuable.

One portion of the subject—and an important one—deserves more than a passing notice. We allude to that part of the article wherein the opinions of private consumers are given. These are of special importance when we consider that the principal objection to the application of the meter system in a few of our cities comes, occasionally, from some one high in authority who advances the plea in support of his opposition to it that the furnishing of water by meter makes it more expensive for family consumption, and necessarily on that account inflicts a hardship upon the poorer class of the community. We remember reading sometime ago when the water supply question was being hotly agitated in Brooklyn, that a prominent official in that city based his violent hostility to the meter system upon the assumption that "it would make water more expensive to the poor." A reference to the statements of several prominent gentlemen of Worcester, Mass., who speak from a wholly unbiased standpoint, fully disproves all these fallacious ideas. All of them concur in one thing, and that is that the meter system is by far the cheapest way to take water for private consumption. Nothing would induce these gentlemen to go back to the old tariff rates. They were in their opinion unjust, unfair to the consumer, and besides in many cases a positive and serious loss to the city. With a liberality which is commendable they treat this branch of the subject from opposite points of view and show very clearly in what respect they were disadvantageous to the supplier and to the consumer respectively.

The public at large in our principal cities have been subjected to a wrong system of education upon the whole matter of water supply. They have become indoctrinated completely with old and musty ideas, and they cling to them and transmit them in full force to their posterity who, notwithstanding the glare of the new lights we are living in, do not seem able to shake them off. They are still groping in the dark, and when the time comes look for relief from measures which have nothing in them but the reputation of previous failures. We suppose the day of enlightenment will come eventually, but it will be only reached after the expenditure of many more millions in hopeless experiments.

PERSONAL.

Mr. John A. Dailey, of Dayton, Ky., is in charge of the draughting department of the Chief Engineer's office of the A., T. & Santa Fe Railroad, with headquarters at Las Vegas, New Mexico.

General J. W. Barnes, of Burlington, Ind., died at the Ætna House, Danville, Ind., Friday. General Barnes was a well-known railroad contractor, and was engaged in building a 100-mile extension of the Toledo, Delphi & St. Louis railroad.

It is understood that the position of General Manager of the Pittsburgh, Fort Wayne & Chicago road, recently vacated by Mr. J. D. Layng, will be filled by D. W. Caldwell, General Manager of the Pittsburgh, Cincinnati and St. Louis lines.

The Supreme Court of New York has granted the order to change the name of the corporation of "*Scribner & Co.*" to "THE CENTURY CO."—the order to take effect on the 21st of June. The July issues of SCRIBNER'S MONTHLY and ST. NICHOLAS will have the new corporate imprint.

Gen. J. A. Williamson, Commissioner General of the Land Office, has tendered to the Secretary of the Interior his resignation, which was promptly accepted. Gen. Williamson states that this step is voluntary on his part, and that he has had it in consideration for some time.

Mr. Robert Moore, who for several years past has been sewer commissioner of the city of St. Louis, has recently resigned that office to engage again in railroad construction. He will this year build several branch lines to the St. Louis and Cairo Short Line Railroad, and will have headquarters in St. Louis.

We are pleased to note the recovery of Mr. Ashbel Welch, Vice-President of the American Society of Civil Engineers, from a severe illness, which has confined him to his house for several weeks past. Mr. Welch has so far recovered as to be able to preside at the last meeting of the Society, and he will be present at the Montreal Convention.

Mr. A. M. Wellington, principal Assistant Engineer of the Mexican National, at present has his headquarters at Morelia, in the State of Michoacan. Mr. George H. Birnie, late Division Engineer on the Wheeling & Lake Erie, is Assistant Engineer with the same company, in charge of a surveying party on the Manzanillo & Laredo, his headquarters being at Morelia.

COLORADO SPRINGS, May 29.—Mythias, a civil engineer of the Denver & Rio Grande, about the 25th of April, was impounded in the Gunnison country, at the head of the Roaring Forks, by snow and high water, and prevented from going south or north by Indians. A relief party was sent from Leadville on the 19th, and returned to-day. They report rescuing Mythias and party Monday afternoon; that they were very weak, having had nothing to eat but fresh meat for thirty-one days.

Edward Prince, formerly Engineer and Superintendent of the Quincy, Ill., Water-Works, and well known as a collector of water-works' statistics, sails for Europe this morning to be absent till Sept. 1. Mr. Prince is investigating the subject of levees, upon which there is hardly any reliable information at present; he has collated the literature of the subject in this country and now proposes to further inform himself by diligent study in the libraries and on the works of England, Holland, Italy and France, sparing no labor or expense to exhaust the subject so far as it is possible for him to do so. Mr. Prince's address in Europe is Messrs. Brown, Shipley & Co., Bankers, London, England.

Mr. J. D. Layng, who has just resigned as General Manager of the Pennsylvania's lines west of Pittsburgh, to take charge of all the lines of the Chicago & Northwestern, is deemed by many to be the best practical railroad man in the United States. He is about fifty-two years of age. He began as a rodman on the Fort Wayne Railroad in 1852 or 1853. He next served in the Engineer Corps of the Steubenville & Indiana; was made Superintendent of the same on completion, and filled the position for many years. When President McCullough became General Manager of the Fort Wayne & Chicago, Mr. Layng became his private secretary, only

to be made in a few months Division Superintendent. When the Pennsylvania Company took the Pan-handle, Mr. Layng became, in addition to his duties as Superintendent, Assistant General Manager of that road. The next step was to nearly the top of the ladder, as General Manager of the Pennsylvania lines west of Pittsburgh, except the Pan-handle, a position which he leaves only to accept the still more powerful one to which he has been appointed, all reports of a misunderstanding with the railroad being without foundation.

The particulars of the Sackrider tragedy in Mexico are given in the Cleveland *Herald* of the 30th ult., in a report from A. M. Wellington, dated Acambaio, Guanajuato, May 8, 1881, addressed to W. C. Wetherell, Chief Engineer. It appears that suspicions of Dr. Sackrider's sanity were aroused about five days previous to the shooting, and he was watched, and, at the urgent request of Mr. Filley, Mr. Wellington was proceeding with all haste to Filley's camp with a man to relieve Sackrider, when he met Mr. Filley on the road, utterly broken down, with the news of the tragedy. The immediate cause of the shooting appears to have been a note-book kept by Dr. Sackrider as a diary, and which had been left at a neighboring hacienda where Dr. Sackrider had been visiting a sick man. The morning of the shooting Sackrider rose at daybreak and put on his clothes while the rest were sleeping. "Filley noticed this in a sleepy way, but was not surprised, for he had been doing it for several days past to visit a sick man in the neighboring hacienda of Anducotin. He then called to Martin in a loud voice, pointing a heavy pistol (not his own, which he had about him) at his head, 'to give him that note-book of his he had.' Martin awoke, saw the pistol, and with extraordinary presence of mind answered at once: 'O yes, certainly,' and started to rise as if to get it, and tried to grab the barrel of the pistol; but Dr. S. was too quick for him, and shot him through the head at the distance of a foot, shockingly mangling him. He then turned instantly, and either purposely or accidentally skipped Filley and shot Jones in the side, the ball passing through part of the liver and lodging in the backbone so firmly that it could not be removed in the autopsy without more mangling than I would permit. Jones lived 36 hours and we hoped for his life, he seemed to do so well; but we shall bury him this afternoon.

"He then shot at and missed Adamson, ran out of the tent as if to go around it, firing in the meantime a shot through the tent, probably at Filley, whom he knew to be a dead shot, and following after him. He then ran around to get a look into the tent and see the effect of his shot, when Mr. Filley's bullet passed almost through his heart. The whole took place in five to seven seconds—just the time it takes a quick hand to throw a cartridge into a Winchester rifle, reach the door of the tent, and fire instantly.

"The dead have all been decently interred, with as much respect and care as the circumstances permitted, in the cemetery at this place, and we shall erect a monument over them. Mr. Jones was a first-class man in every respect, faithful and energetic, and much liked by all the party. He had been married six months ago, his home being in Lodi, Ohio. Mr. Martin was unmarried."

AKRON, O., May 28.—An engineering party to-day completed the survey of the western division of the projected Continental Railway from Omaha, Neb., to this city. The eastern division, from New York City to Akron, will be completed in a few days. The company to-day filed a mortgage here to the Farmers' Loan & Trust Company of New York, in a sum not to exceed $40,000 per mile. The mortgage is signed by J. T. Snead, President of the Continental Railway Company, and by Rosewall G. Ralston, President, and George T. Fitch, Secretary of the Trust company. The road follows the forty-first parallel of north latitude the entire length of 1,300 miles.

THE NEW YORK AND BROOKLYN BRIDGE.

(*Continued from page* 213.)

AIR-LOCKS.

Two sets of double air-locks were provided, each six and one-half feet in diameter by eight feet in height, and capable of containing 30 men, thus enabling the entire working force of 120 men to enter at one locking. The locks were built into the roof of the caisson—the lower half projecting four feet into the air-chamber, and the upper half communicating with each pair of locks by a rectangular trough seven feet long. This trough was enlarged in its upper portion into a circular well of boiler plate eight feet six inches in diameter, which was carried up inside the masonry as the caisson was lowered. Although this style of lock was open to many objections, it had the advantages of occupying less time in passing men through, and saved the fatiguing labor of climbing a vertical ladder while under the air pressure. On the other hand, the locks were dark, and were liable to be flooded by leakage from the well above, cutting off both egress and ingress, and in case of an incursion of the water from below, the avenue of escape would be sooner cut off.

THE SUPPLY SHAFTS.

There were four supply shafts, two being 21 inches in diameter and two being 24 inches diameter, disposed symmetrically throughout the caisson and arranged in the same manner as those used previously. They proved more than sufficient to supply all the concrete that 120 men could dispose of when filling the air-chamber.

SEA WORMS.

Particular care was taken in this caisson to protect the timber from the sea worm. Borings showed that the layer of gravel occurring 12 feet below the river bed was permeated with fresh water, which would be fatal to the worm, and attention was directed to preventing their entrance until this depth was reached. Every beam on the outside of the caisson and also on top of the six course was thoroughly calked, both in order to exclude the salt water and aid the air tightness, and to relieve the iron lining from any back pressure. The surface was heavily graved with a composition of coal tar, rosin and hydraulic cement, the latter material having sufficient body and grit to check the advance of the toredo. Coal tar is of but little use as the worm does not digest the substance through which it bores. Over this coating there extended an unbroken sheet of heavy tin, covering the outside and top of the sixth course. Every seam was soldered and a layer of the tar paper put above and below tin. On the outside of this was a four-inch sheathing of yellow pine which had been creosoted with ten pounds of oil to the cubic foot.

MISCELLANEOUS.

The caisson was launched with a temporary floor extending over the entire base, made necessary by reason of the shallow water. This was not removed until after the caisson had been placed in position.

To obtain still water, the caisson was surrounded by a wall of sheet piling of white pine planks 50 feet long by six inches thick. This served to exclude the tidal current and to keep the caisson stationary.

The following tables show the comparative sizes of the two caissons:

GENERAL DIMENSIONS BROOKLYN CAISSON.

Length over all	108	feet.
Breadth	102	"
Height of air-chamber	9¾	"
Total height when launched	14½	"
Total height when completed	21½	"
Cubic feet of timber in it	111,000	
Weight of iron work	250	tons.
Launching weight of caisson	3,000	"

GENERAL DIMENSIONS NEW YORK CAISSON.

Length over all	172	feet.
Breadth	102	"
Height when launched	14½	"
Total height when completed	31½	"
Cubic feet of timber in it	118,000	
Weight of bolts	180	tons.
Weight of iron work	300	"
Launching weight of caisson	3,250	"

COMPRESSORS.

There were 13 independent Burleigh air compressors, each of which discharged its air into a 10-inch main. This main extended from the compressor-house, a distance of 150 feet under the dock to the caisson, where it branched into two rubber hose six inches in diameter, which extended through the supply shafts to the air-chamber.

FOUNDATION.

After the caisson had been finished, and the slip prepared for its reception, it was towed into position and the final courses put on, making 22 feet of solid timber above the roof of the air-chamber.

An outer coffer-dam of 12 by 12 inch posts, placed four feet apart, with an outside planking of six-inch white pine, was carried up outside of the masonry. Shores extended from each post to the masonry, arranged in tiers for every three courses of stone. The coffer-dam commenced seven feet below the upper course of timber, and was attached to the caisson by a creosoted sill and screw-bolts. The space between it and the timber was filled with concrete, 14 feet in height. The upper course of timber was covered by three and one-half feet, on concrete, amounting in all to 3,500 yards. When the last course of timber was laid, the caisson was floating two feet from the bottom at low tide, and to keep it on the bottom at high tide required four courses of masonry, and when inflated three additional courses were necessary. Owing to the rise and fall of the tide, and the great top-weight of the caisson, the requisite buoyancy and stability could only be obtained by the displacement of a coffer-dam, since the usual appliances of suspended screws were inapplicable. The caisson pipes were protected by the coffer-dam, as they were placed between it and the wall.

Two smaller inner coffer-dams served as water-tight linings to the main well holes of the masonry. The sections of water shaft and the curbing of the air-lock shafts were carried up within them.

The stones were laid by three boom derricks, similar to those used on the Brooklyn foundation. They were guyed solely to the caisson itself, so that the settling of the latter did not effect them. The stones were all bedded down to a uniform rise in one course, with joints dressed with moderate projections, the rise varying from 20 to 30 inches. Both granite and limestone were used indiscriminately.

After sufficient weight had been placed upon the caisson to prevent its movement with the tides, the work of removing the temporary floor and obstructions, in the shape of logs and stones under the edges and frames, was commenced. After this the filling was attacked, and as the site had been used for many years as a dumping ground by the city, the stenches arising from decaying animal and vegetable matter were exceedingly hurtful and disagreeable. This was relieved by keeping the material covered with water until it was gradually removed through the water shaft by the dredges. These dredges constantly kept a hole under the shafts about 6 ft. deep, and removed from 300 to 400 yards per day.

Water for the shafts was supplied by two sets of four-inch pipes, one of fresh water from the city mains and the other connected with a force pump on the dock, which threw a supply of salt water under great pressure and subsequently proved of great service in loosening boulders under the water shaft. As the shafts were 50 feet from

the nearest edge of the caisson, a supply from the river was not available.

SAND SIPHONS.

About 50 pipes were located in the roof of the caisson, passing up through the timber and discharging above beyond the coffer-dam. They varied in size from three and one-half to four inches. As it was first intended to use water as the vehicle by which to remove the sand, the pipes were grouped so as to give one of four inches to every three or four of three and one-half inches. The air-chamber was, practically, air-tight, and in order to maintain a proper degree of purity of the atmosphere, a certain quantity of fresh air was constantly being forced in, the surplus usually escaping under the edges and doing no work.

The first plan tried was a rubber hose, lined with spiral springs to prevent collapsing, which hung from the roof of the chamber in a curve about 14 feet long; and it was thought that, by sweeping this around, all the material within the circle described could be removed with little or no shoveling. This method proved impracticable, owing to the jamming of small stones and sand in the bend of the hose, even when mixed with an abundance of water.

The next scheme was an injector which allowed air to enter an adjustable annular space surrounding a central passage for the sand and air, to which passage a pipe was connected leading to the bottom of the chamber. This worked tolerably well, but wanted too much air for the work done.

Next the hose was shortened so that it reached within a few inches of the bottom. The material was thrown by about six laborers to a point where another laborer kept the lower end of the hose in slow motion from side to side. This worked well, but the sand soon wore out the spiral springs, and the hose collapsed.

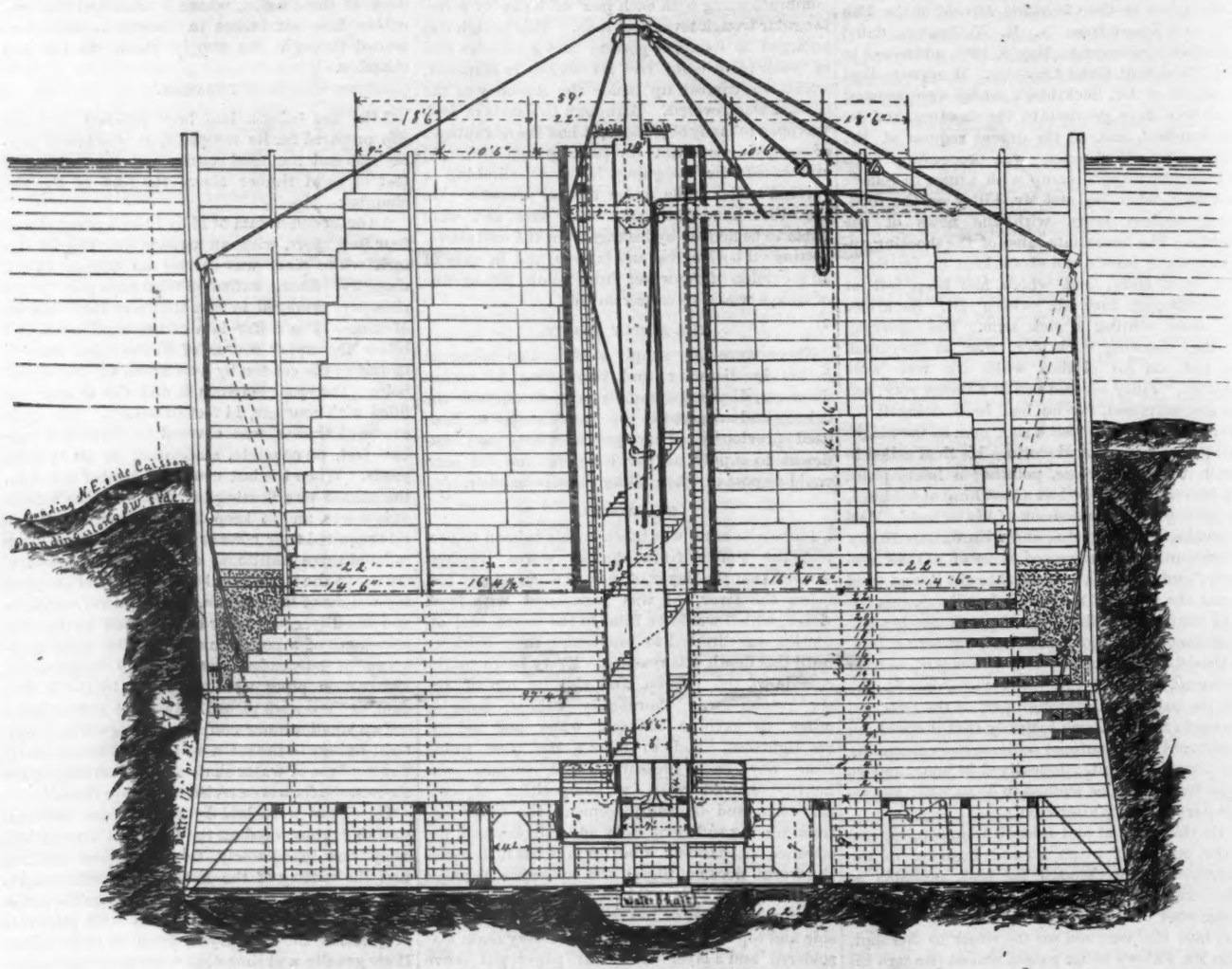
In the final arrangement a piece of pipe two feet long, furnished with a full way cock of same size, was screwed on near the roof, and then a straight pipe extending to within one foot of the bottom of the caisson. In order to work this effectually, the sand and gravel was heaped around the lower end of the pipe until it was two or three feet deep, when the cock was opened, letting the air carry the material out. When working at the best in clean sand, a pipe three and one-half inches in diameter, under 25 pounds pressure, had thrown out 30 cubic yards an hour; yet this speed had never been reached except experimentally. When two stones jammed in the pipe, they were loosed either by forcing up jointed rods from below or by dropping a bar attached to a rope from above. When the pressure had reached 28 pounds, it was found that too much air escaped, and the lower ends of the pipes were reduced to two and one-half inches.

As the sand was very sharp, the pipes soon wore through near the roof. When this occurred a three-inch pipe was forced up about two feet into the three and one-half inch pipe remaining in the roof, and a three-inch cock attached. When this wore out, a second reduction to two and one-half inches was made.

In order to deflect the sand at the tip of the pipes at right angles, both wrought and cast-iron elbows were at first used. The furious blast of sharp sand would generally cut through these in an hour or two, sometimes in a few minutes, the thickness of iron being one and one-half inches. The plan finally adopted was to use an elbow of one foot radius, with an opening in the convex side, equal in width to the interior diameter, and extending to within two inches of either end; into this a back piece of chilled iron, about two inches thick, was fitted and secured by a key driven into two lugs cast upon the elbow. This device was cheap and worked satisfactorily, requiring but a few moments for a man to remove the key and insert a new back piece. At last, when the material was wasted in the coffer dam, the elbows were all removed, heavy granite blocks placed over the mouths of the pipes, and the sand discharged against them into the dam.

When the stratum of quicksand was encountered the dredges were found to be useless, as the sand would escape from the buckets, and the siphons were then the sole reliance. On this account the work of the last 10 feet—from 68 to 78 feet—was very slow and tedious.

(TO BE CONTINUED.)



NEW YORK CAISSON—TRANSVERSE SECTION THROUGH AIR-LOCK.

HOWEVER the Tunis affair may result, it will certainly aid in bringing North Africa under the railroad régime. The French have the Senegal Railway within 250 kilometers of the "lordly" Niger, at Kita 1,000 kilometers from the coast. Of the sixty white men at work on the Senegal-Niger Railroad not one has yet succumbed to the climate.

HALL'S NEW APPARATUS FOR LANDING DREDGED MATERIAL.

The accompanying engravings give an accurate idea of a recently patented apparatus for transporting dredged material—without re-handling—to any desired dumping place. The principal feature of the new method is the landing bridge, Fig. 1, showing the side elevation of this bridge and the scow upon which it rests. The bridge is composed of two nearly equal spans, hinged at the centre, and is designed to connect the landing head with the car-carrying scow. The upright frames at each end support levers designed to bring the spans to the proper level when the cars are run off and dumped. This portion of the plan resembles the bridges in ferry slips, and is operated in a precisely similar manner. Figs. 2 and 3 represent an end elevation of the bridge and car respectively.

This method and apparatus have been in successful operation for the past two years in Boston, in the work of filling in the South Boston Flats. Any further information will be furnished by A. E. Hall, Plainfield, N. J.

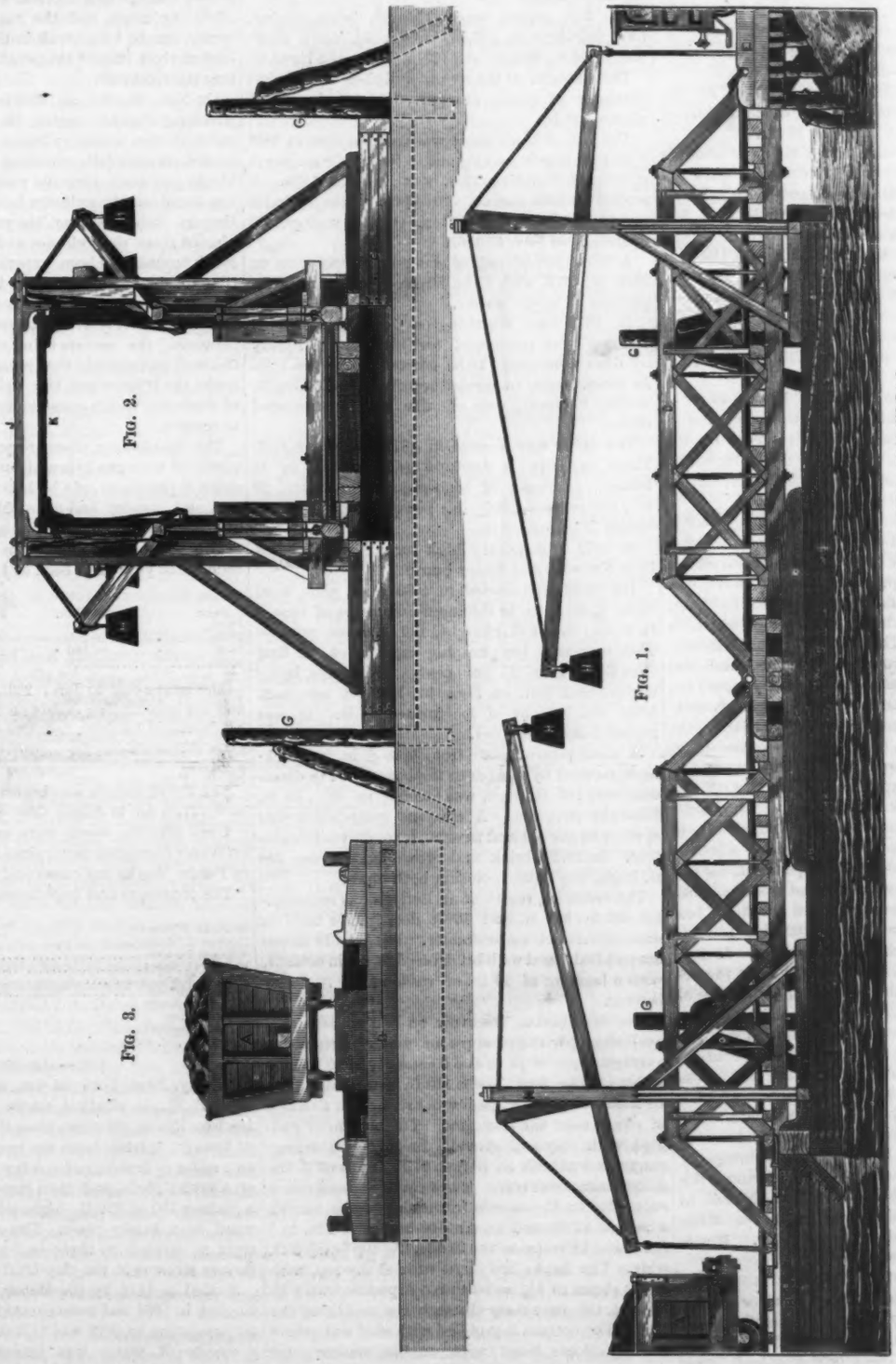


FIG. 2.

FIG. 1.

FIG. 3.

HALL'S NEW APPARATUS FOR LANDING DREDGED MATERIAL.

LIVERPOOL ENGINEERING SOCIETY.

The usual fortnightly meeting of this society was held at the Royal Institution, in Colquitt street, on Wednesday, the 11th inst. Mr. A. Holt, M. Inst. C. E., in the chair, when a paper by Capt. Griffiths, on the propulsion of ships by the use of steam direct from the boilers, in the absence of the author, was read by the honorary secretary.

The leading idea of the author was to propel vessels by the means of steam ejected into the sea or river, somewhat after the manner in which water is driven through nozzles in the Waterwitch

and Viper.

A discussion followed, concluding with a vote of thanks to the author for his paper.

The President announced that the meetings of the society were adjourned to the 12th of October next.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.*

BY J. JAMES R. CROES, M. AM. SOC. C. E.

(*Continued from page* 204.)

XX.—JERSEY CITY.

Jersey City, New Jersey, in lat. 40° 13′ 30″ N., long. 74° 3′ W., is situated on the western shore of New York Bay and the Hudson River.

The average level above high tide for about a mile back from the river is 8 ft.; it then rises abruptly to a ridge running north and south, with an elevation of 130 ft., and again descends to a few feet above tide on the west side.

Laid out in 1804 by the name of Paulus Hook, it was incorporated as the City of Jersey in 1820, and as Jersey City in 1838. The district now supplied with water comprises also Hoboken. In 1852, the population being about 8,000, water-works were constructed after the plans of William Whitwell, C. E.

The water is taken from the Passaic River at Belleville, about 8 miles from the city, and is pumped by steam to a receiving reservoir on the ridge near the river, whence it is conveyed by pipes across the Newark meadows to distributing reservoirs on Bergen Hill, in the city.

The conduit from the river to the pump well is of brick to the edge of the river, whence a wooden box extends out to the channel with a gate at the outer end. The first pipe across the meadows was of cast iron, 20 in. in diameter and 5½ miles long, laid mostly on a salt marsh, the depth of which is from 12 to 40 feet. This meadow was formerly covered with heavy growths of cedars, and the matted roots were deemed a sufficient support for the pipe. Stumps were removed and material taken from ditches spread over the surface. On this, planks were laid, and upon these the pipe, the whole being covered with a muck embankment topped with gravel and sodded. The pipe crosses the Hackensack River on piers, built by the side of the turnpike bridge. It is protected from the shipping by piles and a bracketed string-piece. A 30-in. siphon passes under the draw. The pipe rests on rollers and has slip joints at the ends. It is covered with an air-tight box for protection from frost. In 1862 this conduit had settled in places below the meadows. In 1862 a 36-in. main was laid. On the slope from the receiving reservoir to the meadows, a distance of 2,000 ft. it was of wrought iron and cement; for the remaining distance it was of cast iron. Two rows of piles were driven 3 ft. apart to solid foundation, cut off 16 in. below the ground and cross capped by 10×12 in. pine timber, upon which a brick pier 12×44 in., by 16 in. high was laid. The pipe was secured to this by additional courses of brick up its sides. The main crossed the bridge by the side of the 20-in. one, and siphoned under the draw, resting on a timber foundation secured to piles. This siphon leaked, and in 1871 a diver found that it had settled very unevenly. It was abandoned in 1874 and removed.

In 1871 a 36-in. cast-iron pipe with flexible spherical joints was laid across the river on its bed, just above the old bridge crossing and connection made with the 36-in. main. In 1873 a wrought-iron and cement-lined 36-in. pipe was laid. The foundation consisted of two rows of piles 2 ft. apart, capped transversely by timbers 12 in. square and 6 ft. long, on which are laid five stringers 8 by 10 in., with a plank flooring, the whole securely spiked. On this a brick cradle is built in which rests the pipe imbedded in an inch of cement and an 8-in. arch of brick turned over the pipe, 1 in. of cement intervening, the whole covered with 12 in. of earth and sodded.

The length is 22,300 ft., of which 17,500 ft. are laid on the meadows. There are now three 36-in. submerged pipes crossing the river connected with the 36-in. mains.

The first engine was a Cornish beam engine, pumping through a 36-in. force main, into a reservoir 2,000 ft. distant and 160 ft. above the river.

The diameter of the steam cylinder was 80 in.; diameter of pump plunger, 34¾ in.; length of stroke, 132 in.

The ram of this engine was so great that in 1856 it started nearly every joint in the rising main. A stand-pipe, to relieve this, was built in 1859. A second Cornish engine, with 80-in. steam cylinder and 35-in. plunger, of 132-in. stroke, was put in operation on Nov. 2, 1861.

A third Cornish engine was put in operation on Nov. 22, 1870, with 85-in. steam cylinder and 36-in. plunger of 132-in. stroke.

In 1873 two Worthington Compound Duplex engines were purchased for high-service supply by direct pumping, to be erected on Bergen Hill. In consequence of needed repairs at the Belleville works, however, one of the pair was erected there.

The other was erected in 1877 on Bergen Hill. Their capacity is 8,000,000 gallons each in 24 hours. Diameter of high-pressure cylinder, 29 in.; low pressure, 50¼ in.; pump plungers, 28 in.; length of stroke, 48 in.

In 1873 a temporary high service was supplied by a Knowles and Sibley pump.

The stand-pipe erected in 1859 is of plate iron, from ¼ to $\frac{7}{16}$ in. in thickness; diameter of base, 6 ft. 6 in.; top, 4 ft.; height, 160 ft. above ground. This increased the pumping capacity of the first Cornish engine 75 per cent. This pipe being unprotected fell, on Dec. 31, 1869, it was said, from the weight of ice formed in it. It was repaired and re-erected.

A stand-pipe of plate iron, ¼ to $\frac{7}{16}$ in. in thickness, secured by flanges to the base, 6 ft. in diameter and 160 ft. high, was erected in 1871, 15 ft. from the first one. A silicious composition was applied to the old and new pipes to prevent oxidation. In 1872 a brick and brown-stone tower, 210 ft. high, was built, inclosing both pipes.

The receiving reservoir at Belleville is rectangular, 299 by 368 ft. and 16 ft. deep. It is built in excavation and embankment. The inside slopes are puddled, lined with brick on edge, set in cement, with a backing of 18 in. of rubble for 5 ft. below the top.

The distributing reservoir on Bergen Hill is of oval shape, with 12 acres of water surface, an average depth of 15 ft. and a capacity of 70 million gallons. The flow line is 125 ft. above high tide. Its inside slopes are lined with brick, with a course of stone near the flow line. The bottom is puddled with clay and gravel. In 1871–74 a storage reservoir was built on Bergen Hill, adjacent to the distributing reservoir. It has earth embankments supported on the outside by masonry walls, having a base of 12 ft. and an outside batter of 1 in. to 1 ft., rising by steps on the inside, the top being 3 ft. wide. The banks are 27 ft. wide at the top, with inside slopes of 1½ and 2 to 1. A puddle wall 8 ft. wide at the base runs through the middle of the bank. The bottom is puddled with clay and gravel and the slopes lined with rubble masonry for about one-third of the height from the top, the lower portion being unprotected.

The reservoir is nearly a rectangle and is divided in the centre by a masonry wall containing connecting gates. It is of 27 acres area, and has a storage capacity of 167 million gallons. This reservoir leaked badly when water was introduced in September, 1880. It was found that the water escaped under the bank along the natural surface which had not been properly prepared or puddled.

In December, 1863, a portion of the lining of the Belleville reservoir, 125 ft. long, and half as deep as the slope, fell in. An examination showed that the earth underlying the bricks had been washed out by leakage to a depth of 6 in. The occurrence of heavy rains, and the rapid lowering of the water, caused by a break in the main at the Hackensack river, caused this weakened portion to slide into the reservoir.

On Nov. 22, 1871, an accident occurred, badly wrecking Cornish engine No. 3. The induction valve of the water cylinder broke, the heavily loaded plunger fell, crushing through the guard blocks and destroying the pump. The steam piston drove out the cylinder head, wrecking all contiguous valve gearing, the piston being entirely ejected from the cylinder and the rod badly bent. Much trouble has been experienced from time to time by sludge or anchor ice in the effluent gate-house of the reservoir obstructing the screens. In December, 1871, during varying extremes of temperature, the screws being clogged with ice and the well exhausted, the pressure from without broke the screens and the well filled with a mass of slush ice, which consolidated and took 11 hours to remove.

The distribution pipes are partly of cast iron and partly of wrought iron and cement. There are 323 miles of pipe in all, of which 63 miles are of wrought iron and cement, and about 260 of cast iron. The city is laying no cement pipe at present.

The population, pipeage and consumption for each tenth year have been as follows:

Year.	Population.	Miles of Pipe.	Daily Consumption in Millions of Gallons.
1850	6,856	....	....
1860	29,227	29.6	2.01
1870	82,546	71.2	6.07
1880	120,728	3.23	14.95

The works cost to Jan., 1881, about $4,950,000, and the outstanding bonds amount to $4,838,000. The revenue for 1880, including amount received from Hoboken and for metered water, was about $450,000.

The use of meters was begun in 1862; there are now 177 in use in Jersey City, and 43 in Hoboken.

Until 1871 the works were managed by a Board of Water Commissioners; since that time the Board of Public Works has controlled them.

The engineers and superintendents have been:

	From	To
William Whitwell	1851	1854
George H. Bailey	1854	1860
William Parker	1860	1861
Robert C. Bacot	1861	1866
John F. Ward	1866	1871
John F. Culver	1871	1875
S. B. Dougherty	1875	1877
Levi W. Post	1877	1879
W. W. Ruggles	1879	1881
Wilmot W. C. Sites	1881	.....

XXI.—ALBANY.

Albany, New York, in lat. 42° 39′ 3″ N., long. 73° 32′ W., is situated on the west bank of the Hudson River, 160 miles from the ocean. The site of the city extends from the bank of the river with two miles of frontage, for a few hundred feet over an alluvial plain, and then rises quite abruptly to a plateau 150 to 220 ft. high, which extends westward in a sandy plain. The slope towards the river is divided by three or four valleys worn by former streams in the clay bluffs.

Settled in 1614 by the Dutch, possessed by the English in 1664 and incorporated as a city in 1686, its population in 1813 was 11,000. About this time a supply of water was introduced from small streams. The water was conveyed 3 miles in a cast-iron pipe of 6 in. diameter. Three hundred tons of these pipes were laid, some of which are still in use after a longer term of service than is recorded of any other cast-iron pipe in the United States. They are claimed to have been the first cast-iron water pipe made in the United States. Two straight

*Copyright 1881.

pipes and one branch of this pipe are in the possession of the American Society of Civil Engineers, having been presented by L. B. Ward, C. E., for exhibition at the Centennial Exhibition in 1876.

In 1830, the population being 24,000, a company was formed for supplying the city with water obtained from three streams—Maezlandt Kill, Middle Creek and Patroon Creek—across each of which a dam was built. On the Maezlandt Kill a second small reservoir was formed and housed in. Water was brought to this by a wooden trunk, or flume, 3 ft. square; from here it was conducted to the city, partly by a small square brick conduit and partly by a 20-in. cast-iron pipe. The water from Middle Creek and Patroon Creek was also brought to this conduit in square brick aqueducts of small size. The distribution was by cast-iron pipe and wooden logs from a small reservoir, situated south of the railroad on Eagle street. This company, failing to adequately supply the city, surveys were authorized by the City Council in 1842; several were made from time to time, but none adopted until 1850, when, the population being 50,000, works were built after the plans of William J. McAlpine.

Water was taken from Patroon Creek at a point four miles from the city. A dam was built and water conveyed by a masonry conduit to a reservoir on Bleecker Hill, about a mile from the river. A second impounding reservoir was formed by a dam just below Tivoli Falls.

The brick conduit connecting the Patroon Creek reservoir, called Rensselaer Lake, with the Bleecker reservoir, was 21,000 ft. in length. It was 8 in. thick and of oval form, $3\frac{1}{2} \times 4$ ft. in diameter; its grade was 1 ft. to the mile, and its capacity when flowing $3\frac{1}{2}$ ft. of water was 600,000 gallons daily.

The ground for foundation was cleaned, the earth excavated was used for back filling. The embankments were built of clear earth wet and rammed in 6-in. layers, and carried 9 ft. above the grade line. The width of foundation was 42 ft., slope, $2\frac{1}{2}$ to 1, and the top of the bank 6 ft. wide. The conduit was completed and in use by September, 1852, when water was let into the Bleecker reservoir. After being in use a short time the conduit was found to have settled and cracked very much throughout its entire length. Cracks from 50 to 200 ft. long were found admitting large quantities of quicksand and water. At other places large holes in the bottom allowed heavy leakage; the top arch in many places hung only by the bricks, the mortar having been washed out. It was repaired and afterward did service.

The dam of the Rensselaer Lake reservoir is an earth bank; it is carried 8 ft. above the water line, and is 34 ft. high; it is 10 ft. wide at the top, has outside slopes of 2 to 1; it was built in layers and puddled. The inside slope of $1\frac{1}{2}$ to 1 has a clay puddle lining, covered with coarse sand. The area of the lake is 30 acres and its capacity 160,000,000 gallons. The Bleecker Hill reservoir was begun in the spring of 1852; it is in excavation and embankment, and is 500 by 570 ft. and contains 20,000,000 gallons; its inside slopes were puddled and covered with flagging stones; these were removed in 1876 and a paving of blocks in cement substituted. Both reservoirs had stone masonry gate-houses.

The reservoir at Tivoli Falls has an earthen dam 25 ft. high.

Its area is 20 acres, and it contains 30,000,000 gallons. This reservoir was connected with an old reservoir of the first company, at Eagle street, south of the railroad, for the supply of the lower districts.

While the works were in construction, the use of water from Maezlandt Kill and Middle Creek was continued. This supply was afterward incorporated with the new. The old reservoirs were repaired and the connecting trunks and conduits cleaned. Connection was made with the city mains by means of a 20-in. iron pipe.

The works were constructed in a sandy country. The increase of population and the clearance of the water sheds of their timber growth caused great deficiency in supply.

The quality of the water from Rensselaer Lake was generally quite bad from its shallowness. The sand, driven by wind in storms, gradually filled this lake up, so that much water was lost by its incapacity to hold storm water.

In 1872 the supply from Rensselaer Lake had fallen so short that a Worthington pump of 1,000,000 gallons capacity was erected to pump water from Tivoli Lake into the Bleecker reservoir. This materially increased the supply, but afforded but temporary relief. A second pump was erected in the following year, forcing water into Rensselaer Lake.

In 1873 a plan was adopted to pump water from the Hudson, and after receiving the endorsement of James P. Kirkwood, C. E., and Prof. C. F. Chandler was undertaken by I. C. Chesbrough, C. E., as engineer. Water is taken from the Hudson River at the foot of Quackenbush street and conveyed by a tunnel 870 ft. long to the pump-well, where a pair of compound condensing beam engines, coupled to one fly-wheel, force the water to the Bleecker reservoir.

A brick shaft 10 ft. in diameter and 47 ft. deep, secured to a cast-iron shoe by vertical tie rods, was sunk on the pier between the river and Erie canal basin. Much difficulty was encountered in the influx of water, and much work was done by a diver. On reaching the depth of 47 ft., the first shaft being much strained and cracked, a second was sunk within it $7\frac{1}{2}$ ft. in diameter; this was forced with much difficulty to a depth of 51 ft., or about bed rock, where the existing work was secured by cast-iron cylinders, and further progress made by the same. The shaft was carried to a depth of 80 ft., when a horizontal drift 6 ft. in diameter was driven toward the pump well, 220 ft.

The tunnel from the engine house to the edge of the Erie basin had been completed; it was mostly through hard-pan gravel and was bricked. This was pumped out, and a short distance from the basin end of the tunnel a shaft was sunk in the rock 13 ft., from which a drift descending $2\frac{1}{2}$ to 1 connected with the rock tunnel.

Connection between the inlet shaft and the river was made by a masonry culvert opening into the river about the middle of the pier, its outer end fitted with gates. The shaft is fitted with a copper wire screen 6 ft. 4 in. in diameter and 16 ft. high.

The foundation for the engine and well was carried down to bed rock. Each engine has a steam cylinder of 42-in. diameter and 132-in. stroke, and two plunger pumps of 22-in. diameter of plunger and 84-in. stroke.

The engines have a capacity of 10,000,000 gallons per day. The length of the force main is 9,723 ft. It is of 30 in. diameter. The lift is 249 ft.

A better high service being needed, a reservoir was constructed in 1875 on Prospect Hill, formerly known as Powder-house Hill, 1,800 ft. distant from the Bleecker reservoir and 55 ft. above it.

Water was taken from the Bleecker reservoir through a 24-in. main to a pump well 1,390 ft. distant, where it was elevated to the Prospect Hill reservoir by means of a pair of compound condensing beam engines connected with one fly-wheel. Each engine operates one pump of the Thames Ditton pattern.

The diameter of the high-pressure cylinders is $11\frac{1}{2}$ in., stroke 58 in. Diameter of the low-pressure cylinders is $20\frac{1}{4}$ in., stroke 72 in. Diameter of pumps, $21\frac{1}{4}$ in., diameter of plunger 15 in., stroke 54 in.

The Prospect Hill reservoir was completed in May, 1877. Its area is $1\frac{3}{4}$ acres, depth 14 ft. Its capacity is 6,743,378 gallons. The banks are carried 6 ft. above the flow line. The embankment is of sand rolled in layers. The outside slopes are 2 to 1. The bank is covered with soil and sodded. The inside slope is $1\frac{1}{2}$ to 1. The bottom is lined with puddle for 6 in.; on this lies 6 in. of concrete, and on this again is 18 in. of puddle, the whole covered with brick laid in cement 4 in. thick. The inside slopes have 6 in. of puddle and concrete, and 2 ft. 6 in. of puddle over it for a height of 10 ft.; they are lined with 10 in. of brick in cement. From here to 5 ft. above the water-line is a paving of stone in cement backed with 3 ft. of gravel laid over 3 ft. of puddle and concrete.

The city is divided into upper and lower services, the dividing line being about 120 ft. above the river. The distribution is by cast iron pipe. On Jan. 1, 1880, there were 75.69 miles in use, of which 42.45 miles are less than 6 in. diameter.

The use of 3-in. pipe has been discontinued. There are 36.45 miles of 4-in. pipe in use.

The annual reports do not contain full statements of the receipts and expenditures of the works. In January, 1880, the Commissioners report that heretofore the net income had been ample not only to make all improvements and extensions but also to contribute largely to the payment of the debt, but that the introduction of pumping works had greatly increased their expenditures. The payments for 1879 were $57,353.23, and the receipts from special rates $31,235.37.

XXII.—INDIANAPOLIS.

Indianapolis in Indiana, on the east bank of the White River, in lat. 39° 55′ N., long. 86° 5′ W., comprises an area of about 20 square miles on a plane sloping to the southwest at the rate of about 15 ft. to the mile, and 30 ft. above low water at the river bank.

The city is on a bed of gravel from 60 to 80 ft. thick, overlaid with five or six feet of alluvial soil and underlaid with from 5 to 10 ft. of clay, beneath which is another bed of gravel. The ground water in the upper gravel rises from the river level at the rate of about 20 ft. to the mile, and furnishes a large proportion of the water used for domestic purposes by well. It is badly contaminated by drainage from cesspools and privy vaults.

Founded in 1819, its population in 1869 was 30,000 when a private company was organized to supply water. Two wells 20 ft. in diameter and 80 ft. apart were sunk near the river bank to a depth of 10 ft. below low water in the river and connected by a tunnel. The lower 6 ft. of one of the wells is only 12 ft. in diameter. A 4-in. pipe was sunk 80 ft. to the lower water-bearing stratum, but its yield is very small. The water from the lower level is strongly impregnated with mineral salts. It is used by some manufacturing establishments from tube wells, but scales boilers badly and, even when cold and running in a trough, forms a hard reddish deposit.

The Water Company owns the Central Canal, which was built by the State about 1850, and extends from the city to Broad Ripple, on the White River, 8 miles distant, and is used no longer for navigation, but furnishes water-power to several mills in the city, and for driving three turbine wheels, which operate three rotary pumps and six single-acting pumps, of B. Holly's design, of 16-in. diameter and 16-in. stroke. A Holly steam engine is also connected with the pumps. The water is pumped directly into the mains.

The supply from the wells was sufficient for a few years, but it soon became necessary to draw water from the river directly, in case of fire or any extraordinary demand. The works were located on the concave shore of a bend in the river, where the

drainage from mills and factories above them passed close to the bank and over the inlet pipe. In 1879, a crib filled with stone was sunk in the river and covered with gravel. It was 50 by 25 ft. and 4 ft. high. Into a box at one end the suction pipe of the pumps was led, with the object of procuring filtered water. On May 14, 1881, the box and crib broke in, and a considerable amount of sand was drawn into the suction pipe and through the pumps into the mains, also filling the vertical suction pipe into the well with sand. For some days the water was drawn from the river without clarification of any kind.

(TO BE CONTINUED.)

We have received the first seven annual reports of the city of Newport, Ky., from B. R. Morton, City and Water-Works Engineer.

CORRESPONDENCE.

THE LARGEST CANNON, ETC.

SHREVEPORT, May 27, 1881.

EDITOR ENGINEERING NEWS:

Knowing the great interest you take in all scientific matters, I would kindly request you to state, in your next issue, the weight of the largest cannon of the present day, the distance it throws a ball, the weight of ball, and what size steel plate it shatters?

By doing this you will dispel the illusion under which several persons are laboring, and oblige yours truly,

W. J. HARDEE.

[We cannot, of our own knowledge, answer the above questions, but will be pleased to publish the information which may be sent us.—ED. ENG. NEWS.]

CINCINNATI WATER-WORKS STATISTICS.

OFFICE OF CITY WATER-WORKS,
CINCINNATI, May 26, 1881.

EDITOR ENGINEERING NEWS:

In relation to article on Cincinnati Water-Works Report, in last edition of ENGINEERING NEWS, pointing out errors of Table No. 17, state that it was compiled from statistics furnished by officials of various water-works, and any errors are due to that source. By giving the above a space in your valuable paper you will greatly oblige

Yours truly,

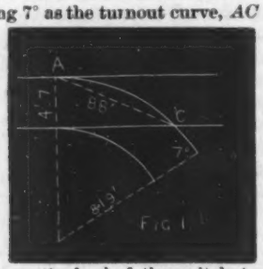
A. Y. MOORE, Supt. & Eng. Works.

FORMULAS FOR TURNOUTS.

EDITOR ENGINEERING NEWS:

Having occasion to put in some turnouts, some times with the main line on a tangent, sometimes on a curve in same, and sometimes in an opposite direction, I used the following formula to locate the point of the frog, and as it is simple, needs no book of tables, logarithms, or trigonometry, I send it to you for the benefit of the craft:

Fig. 1. A turnout from the main line as a tangent, using 7° as the turnout curve, AC being the



distance from the heel of the switch to the point of the frog.

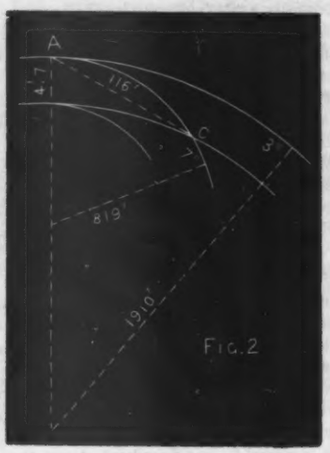
Formula: $AC = \sqrt{2g \times R}$, g being the gauge of the track = 4.7 ft., and R being the radius of the 7° curve = 819 ft., the result is 88 ft.

Fig. 2. A turnout from the main line as a curve in the same direction.

Formula: $AC = \sqrt{2g \times R}$, g being as before 4.7 ft., and R being the radius of a curve obtained by *subtracting* the curvature of the main line from that of the turnout, or 7° (turnout)—3° (main line) = 4°, and the radius = 1432 ft., the result 116 ft.

Fig. 3. A turnout from the main line as a curve in the opposite direction.

Formula: $AC = \sqrt{2g \times R}$. g = 4.7′, and R = 573 ft. of a 10° curve, obtained by *adding* the



curvature of the 3° main line to the 7° turnout curve, the result is 73 ft.

And thus it is easy with all degrees of curvature, and all conditions of the two lines, to get the distance between the heel of the switch and the

point of frog. For instance in a crotch-frog (Fig. 3), where both curves the same, say each equal to 5°, then R in the formula is the radius of a 10° curve, and the result is again 73 ft. W. M. JOHNSON.

END OF TRACK, Tex. & Pac. Railway.

NOTES ON LEVELING.

SAGINAW CITY, Mich., May 30, 1881.

EDITOR ENGINEERING NEWS:

Mr. Cain, in your issue of May 14, claims that my rod "is unsuited to a hilly country, where sights *not less* than 50 ft. are not always procurable." When the rod stands as near as that, if you cannot see a foot or half foot mark, let the rodman set the target near enough so that you can see some part of it, and thereby read the tenths, after you have first read the hundredths carefully; or if it is not higher than he can reach, let him take hold of the rod from the back, with his thumb on one side and finger on the other, and raise or lower his hand till it comes opposite the nearest tenth; then read the feet and tenths with the naked eye, which can readily be done at that distance. Or, if you have no target and your line of sight is so high that he cannot reach it, let him take a stick of any kind and run it up along the face of the rod till you can see the end of it in the telescope; then read the feet and tenths as before.

On a closer examination of his method of keeping field notes, in consequence of his claiming that I "have no check on the elevations of intermediates by this method," I find that instead of having "a double check on both intermediates and turning points," he has but a single check on his turning points and none at all on his intermediates. Instead of subtracting his observation directly from his height of instrument as I do, he first finds the difference between his observation and last B. S., and then adds it with proper sign to the elevation of the last change point, with the additional chance of error by using the wrong sign. I fail to see where there is any check at all.

As to the change points, I subtract my first foresight from my height of instrument, then add my second backsight to that elevation for my second H. I. Then for a first check I find the difference between my first F. S. and second B. S. add it (with the proper sign) to my first H. I., and see if it corresponds with my original work. This check corresponds with his original work. Then by using a "separate piece of paper" (which I find very useful frequently for other purposes, and consequently have some with me at all times), I get my second check, which corresponds with his first and only check. In order to be very sure no errors are made, the expense is but small to let another man run over the same line, taking entirely independent change points, and then compare the notes of the two, and if either one makes a mistake, either in reading the rod or carrying out the notes, the other will detect it, especially if the change points of one man are half way between those of the other, so that two or three intermediates on the same setting come each side of the other man's change point. I have no objection to carrying out the notes in the field if you have time to sit down and make a business of it, which, as Mr. Cain says, "there is generally an abundance of time for it;" but what I do object to is trying to take the observations and carry out the notes at the same time. When a man is watching his rodman to see when he is ready, watching his bubble, making and recording his observations, he generally has enough to think of without carrying out his notes at the same time, in which case he would be very likely to get them mixed, which has been my experience.

I. H. LEAVENWORTH, C. E.

LAND SURVEYORS.

EDITOR ENGINEERING NEWS:

The belief that the profession of land surveying has become despised, and consequently very much demoralized, appears to be very prevalent all over the United States at the present time. Our best men have abandoned the practice and entered the more lucrative and esteemed profession of civil engineering; but the duties relating to the former branch are none the less pressing, and of importance to the general welfare of society, than they ever were; on the contrary, land is now more valuable than ever. The length of time which has elapsed since the boundaries were first run, in many cases date back several generations. In the meantime floods, fires, and the destruction, intentional or otherwise, of old landmarks, call for the highest order of ability on the part of the surveyor, to re-establish these ancient boundaries. The complications resulting from the exceedingly loose manner in which the surveys were carried out by the general government, with the very glaring discrepancies between the field-notes and the actual survey, would not be credited by those not conver-

sant with the matter, and will form a very fruitful subject for investigation by the courts in the course of a very few years.

It is also a matter of interest further to know that in the zeal of politicians to multiply offices that in a great many of the States they have succeeded in creating legal offices of city and county surveyors, and filled said offices with their own creatures, who in most cases had no knowledge whatever of our profession. Many very hard things could be said, with perfect truth, of the doings of these legal surveyors, which would bring the blush of shame to the cheek of any honest American. These people, by their ignorance, and the ignorance of their poorly-paid deputies, have succeeded in complicating the question of boundaries to an alarming extent. These matters are of common report in the profession, but are simply put forward as a peg on which to hang our argument.

We now wish to arrest the attention of our professional brethren, and endeavor to get them to unite in an effort to recapture the field from which we have been driven. It is worth the effort. The best men in the nation will second our endeavors if they are persuaded that we are actuated with honest motives. The courts would gladly see again at their bar the man of science who could give unanswerable reasons for his acts. The general government would scarcely dare to be behind the age, but would take from our ranks their surveyors general, who would initiate a different order of things to what has ever yet been known in this country. My fellows in the craft, "it is not too late to mend;" let us cast in our lot with the advocates of reform, and endeavor to procure legislation in our several States as follows: To invest the Governor of the State with the authority to appoint a Board of Examiners of not less than five persons, selected from the best men in the profession; they shall pass upon the competency of all persons who wish to follow the profession of land surveyor in the State; shall issue certificates of competency, which shall be signed by the Governor, giving authority to practice within the State; the courts shall be instructed to hear only such persons in evidence, and also shall not sustain a claim made by an unlicensed person for duties performed as a surveyor; the State, county and city recorders shall be inhibited from receiving documents relating to surveys of land to be placed on file which do not bear the signature of a licensed surveyor; no person shall be permitted to fill the office of State, county or city surveyor, unless he is duly licensed.

It is confidently anticipated that the enactment of such provisions would grant us the needed relief, and call to our ranks such persons of talent and culture as would make us proud of our profession, and would at the same time benefit us especially in a pecuniary sense. Let us nominate a dozen or more of our best surveyors and civil engineers in each State and Territory of the Union, and as many patrons of our cause among the University men, lawyers, legislators, capitalists, etc., as we can impress with the justice of our cause. Let each State work in concert with a central body for the dissemination of information concerning the progress thereof, and then keep up the fight if it lasts "all summer," or many summers.

FREDERICK T. NEWBERY,
Assistant Engineer Southern Pacific Railroad.
Letters addressed Room 62, S. P. R. R. offices, cor. Fourth and Townsend sts., San Francisco, Cal., will receive prompt attention.

HOWE TRUSS SPLICE.

PORTLAND, Me., May 24, 1881.

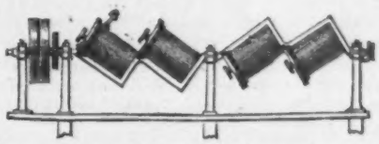
EDITOR ENGINEERING NEWS:

Mr. F. C. Doran gives your readers a whole column in your paper of May 21, but is very careful not to answer the question I asked him, which was a very plain one, and which would have shown conclusively whether his splice, as well as what he calls his science, was good for anything or not. Your first correspondent asked for the latest and best American practice in splicing a bridge chord. Mr. Doran replied in your paper of Jan. 1 by giving a splice which, he stated, was designed on scientific principles, and had borne the test of experiment and practical work. The splice was so peculiar, and, to my eye, as a practical builder, so defective, that I asked Mr. Doran to tell us when and where his splice had borne the test of practical work. This he was unable to do, and took back his statement, and also confessed that he had never designed nor built a bridge with such a splice, and moreover that he did not offer it as one to be followed out in practical detail. Just what he did give it for is not plain. If a splice which is designed on "scientific principles" cannot be followed out in practical detail, of what use are the scientific principles? In my last letter I asked Mr. Doran whether he knew, as a matter of practical bridge carpentry, that four 2½-in. hooks had ever been proved to be stronger than one hook a foot long, and I asked the question because I knew as a matter of fact that hooks a foot long frequently sheared off. To this question he makes no reply whatever, but treats your readers to a whole column of rambling matter, which will hardly impress the practical man as of any great value. When, in reply to your first correspondent, who asked for the best and latest American practice, Mr. Doran submitted his plan for a splice, designed as he says on scientific principles, and which he stated had borne the test of experiment and practical work, and consumed two columns of your paper in working out all of its dimensions to the hundredth of an inch, and concluded by pronouncing it 27 per cent. stronger than the splices in common use, I supposed he intended to present something for practical adoption. It seems, however, that he only intended to illustrate the principle, so thoroughly put in practice many years ago by Mr. Latrobe, that the shearing, tensile and crushing strengths of the joint should be equal; but why he could not have illustrated the principle just as well by a good joint as by one that no person would think of using I cannot see. Mr. Doran says, "The chief merit of the plan submitted is in the equalizing of the tensional, shearing and crushing strains." The chief merit in his plan then would be fully realized if we made the hooks say ⅛ inch deep, ¼ inch long and placed them ¾ inch apart, making, of course, enough of them to get the necessary total shoulder area. I do not offer this as a plan to be followed out in practical detail, but only as a specimen of the wonderful results to be obtained by such science as Mr. Doran gives us. Your readers will no doubt be quite able to choose between the practice of such carpenters as the late D. C. MacCallum, and the so-called science of Mr. Doran. In conclusion I would suggest to your correspondent C. E. W. D. that his second splice, given in your paper of Dec. 4, has been long and successfully used by many good builders, and if he will accept a word of advice he will not abandon it for any such splice as that submitted by Mr. Doran, even though the latter be proved by the "analysis of science" to be 27 per cent. stronger than the former.

E. S. SHAW.

TESTING BROKEN STONE.

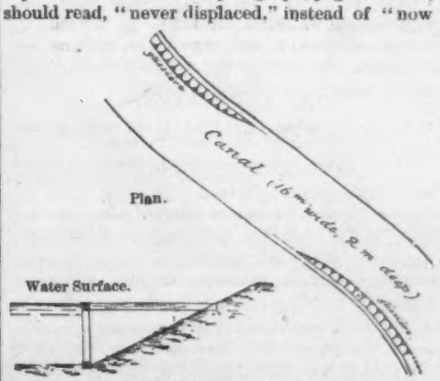
The *Bulletin du Ministère des Travaux Publics* describes a series of investigations conducted by the French Administration for ascertaining the resisting power of different classes of broken stone employed in the formation and maintenance of roads. These experiments were directed toward two objects; to ascertain the resistance of different classes of stone to wear and to shock, and their resistance to crushing. With regard to the first a standard of comparison is employed, and the stone is submitted to treatment in a testing machine of the form shown in the annexed sketch. This machine consists of two groups of four cylinders each, mounted side by side on a bent frame, which terminates in horizontal shafts, at one end of which on one group are mounted pulleys and gearing for transmitting motion to the other group. The axial distance apart of these shafts is 16 in., and the cylinders are about 7¾ in. in diameter and 14 in. long. In one of these chambers is placed a standard sample of porphyry, and in the other the stone to be tested; the charge averages about 11 lbs. The machinery is driven with a speed of about 2,000 revolutions an hour, and the stones are subjected to attrition, and also to a to-and-fro movement from end to end of the cylinder. After about five hours the cylinders are emptied and their contents are carefully washed, the fragments precipitated being divided by sifting into three classes—those which will not pass through openings .39 in. in diameter, those decreasing from this size to .07 in., and the dust smaller than .07 in. The first portion is returned to the stone being tested, and the third is weighed, the relation it bears to the original charge indicating the value of the material tested. Experiments showed that the best samples yielded 2 per cent. of their weight in dust, and for this class of stone a co-efficient of 20 was adopted. The compression tests were obtained by submitting cubes 1 in. square to the action of an hydraulic press. The best specimens rarely showed a resistance of more than 20 tons per square inch, and a co-efficient of 20 was also adopted for stones of this quality. Altogether 637 samples of stone were tested.



CORRECTION.

CABLE TOWING ON CANALS.

[The third line of fifth paragraph, page 214 ante, should read, "never displaced," instead of "now displaced. We reproduce the cut with the proper explanations.—EDITOR ENGINEERING NEWS.]



SECTION OF CANAL BANK AND OF GLISSIÉRE.

NOTES.

THE WATERS OF THE ST. LAWRENCE.

An Ogdensburg paper thus speaks of the St. Lawrence River: "There are certain things about the St. Lawrence that every one ought to know. The St. Lawrence River is not affected by freshets, and there are no sudden changes from that cause. A gale down the lake, blowing the water into the river for 12 hours, will raise the water above the rapids from one to three feet. A gale up the river, holding the water back in Lake Ontario, will cause it to lower in the river to nearly the same extent. A gale down the river makes it easier for a steamer to ascend the rapids, while one up makes it harder. There are periodical rises and falls in the St. Lawrence, extending over several years, from high to low-water mark, and vice versa. Sometimes this period covers four or five years, and sometimes ten years. About the beginning of the past winter extreme low water

mark was reached. Since the opening of the river the present spring, the water has been rapidly rising. Up to this writing it is about 16 inches. From the head-waters of Lake Superior to the rapids the average flow of water is 20 miles a day. The water-fall during the winter over the sources of supply of the St. Lawrence River has been very heavy, hence we may expect high water in July. The local effects of winds will be the same in high water and in low water seasons."

WHY PUMPS WILL NOT LIFT HOT WATER.

A pump will not lift hot water because the suction pump depends for its action on atmospheric pressure. When the piston of such a pump is raised a vacuum is formed beneath it, and the water from the well or reservoir is forced to follow the piston up to the top of its stroke by the atmospheric pressure on the water surface with which the pump is connected. When the attempt is made to lift very hot water, however, the rise of the piston causes an abundant evolution of steam or vapor from the water surface, which fills the space beneath the piston. This steam or vapor has considerable tension, and exerts a sufficient back pressure. On this account, the lifting of hot water, save for very small lifts, is impossible. When hot liquids are to be pumped, therefore, the point of supply should not be below the pump, but rather a little above it, so that the liquid may flow into it.

THE CENTER OF POPULATION.

General Walker, Superintendent of the Census Bureau, has published a curious bulletin showing the position of the center of population since 1790. In 1880 it was eight miles west by south of Cincinnati, having moved west fifty-eight miles during the preceding decade. The following is the approximate location of important points from 1790:

1790. Twenty-three miles east of Baltimore.
1800. Eighteen miles west of Baltimore.
1810. Forty miles northwest by west of Washington.
1820. Sixteen miles north of Woodstock.
1830. Nineteen miles west by southwest of Moorefield.
1840. Sixteen miles south of Clarksburg.
1850. Twenty miles southeast of Parkersburg.
1860. Twenty miles south of Chillicothe.
1870. Forty miles east by north of Cincinnati.
1880. Eight miles west by south of Cincinnati.

GENERAL INTELLIGENCE.

☞ *We solicit and are always pleased to publish in these columns any items of interest that may be furnished us.*

GAS AND WATER.

Governor Cornell has signed the bill incorporating the St. Johnsville (N. Y.) Water-Works Company.

Chicopee, Mass., is agitating the question of water-works. Voting on the subject took place last Monday.

The surveying class of Williston seminary, under the direction of Profs. Alvord and Sawyer, have been engaged by the town of Easthampton, Mass., to make surveys for the proposed new water-works.

The Salem, Mass., Common Council passed bills last Monday appropriating $40,000 to fill the North River basins, $100,000 to fill the south mill-pond, $500 to purify its shores and $6,000 to build a new hose-house.

The people of Chillicothe, O., have become so far interested in securing water-works that a deputation of eighteen of its City Council spent Decoration Day in inspecting the water-works system of Zanesville.

Sharpsburg wants to connect with the Pittsburgh water-works. According to Mr. Lowry's estimate, the total cost would be $39,474, and the rate for water at Sharpsburg 10 cents for every 1,000 gallons.

There are serious differences between Easton borough Pa., and the Lehigh Water Company, which supplies the town with water. The borough has voted to build new works and the company offers to sell out.

We learn that gas and water matters in Hannibal, Mo., and vicinity are in a thriving condition. J. H. Decker, the superintendent of both the Hannibal Water Co. and Hannibal Gas Co., is largely extending the mains of both works, in order to meet the increased demand. During the season machinery of the latest and best design will be put in the gas-works, largely increasing the working capacity.

The town of Lake, Cook County, Ill. (P. O. address, stock yards) will advertise this week in Chicago papers for bids for two new pumps for their water-works, with a capacity of from eight to ten million gallons every twenty-four hours. The water supply of the town is an unsettled question, which seems to be as far away from a solution as it was before the town had any water-works at all. This town went into partnership with Hyde Park in water-works; the location of the works was a blunder, the construction was another, the growth of the two towns has been very rapid until, now that the artnership has been dissolved, the works are insufficient for either and so both are moving for an increased supply. It is intended to extend the present pipe farther into Lake Michigan and run a new 24-inch main across Hyde Park.

After the first "spurt" of water-works enthusiasm in Madison, Wis., the citizens have settled down to the usual preliminary discussion of the subject, and the "History and Statistics of American Water-works" are being largely added to by contributions from the clerks of Western cities, to whom the Madisonians have appealed for information. The Holly Manufacturing Company are furnishing a good deal of "direct pressure" on the subject, and it is probable that other competitors are in the field. The *Daily Democrat*, which believes in water-works, remarks: "In considering the question of water-works, the people of Madison should not forget that a complete system of water-works would do more for the city than merely afford it ample protection against fire and give its citizens a supply of water. Nothing that the city could do would add more to its attractiveness than water-works. The city would not then be under a cloud of dust during dry seasons and carriage riding disagreeable instead of a pleasure. Water-works would enhance the value of every lot in the city much more than the additional cost it would put upon it. A complete system of water-works would add to the value of the real estate double the cost of the works just as soon as constructed and put in operation."

If this city expects soon to get a system of water-works, the present would not be a bad time to move in the matter. The country is full of idle money seeking investment. Stocks of all kinds are away up to four times their worth, the government 3½'s per cents (the Windom's) certain to be called in in a short time and paid, are 4 per cent. above par and the 5 per cents. which remain and are due in July and certain to be paid before January, are 5 per cent. above par. The Western Union Telegraph stock, watered up to five times the value of the property, is $1.26¾. Chicago City 4 per cent. bonds are $1.08¾. Chicago city water bonds, 7s. of 1892, stand at $1.22; the same of 1894, at $1.24. District of Columbia 3.65s of 1924 are $1.08¼, and all other stocks and bonds in proportion. This city would not have a particle of difficulty in getting any sum needed at 5 per cent., and it probably would not have to go outside the corporation limits to get $80,000 for from ten to twenty years at 4½ per cent. Within the next four months the government will call in and pay a hundred millions of dollars of the public debt, and all this vast sum of money will be seeking investment, so that the rate of interest is certain to be low for a time at least.—*Madison Democrat.*

STREETS, DRAINAGE, ETC.

Glens Falls, N. Y., has applied to the State Legislature for permission to issue bonds for sewer purposes.

The contract for improving State street, Chicago, was awarded as follows: From Taylor to Twenty-second, to A. L. Amberg & Co., at $66,630; Twenty-second to Thirty-first, to Thomas W. Sexton, at $58,849; from Thirty-first to Egan avenue, to A. J. McBean, at $56,032.

The Governor of Massachusetts has appointed E. S. Chesborough, of Chicago, Ill.; H. P. Wolcott, of Cambridge; Charles F. Folsom and Alonzo W. Boardman, of Boston; and Asel Ames, Jr., of Wakefield, to act under the resolve passed by the Legislature providing that the Governor and Council may report to the next General Court a comprehensive plan for the drainage of Boston and its surroundings, including the valleys of Charles and Mystic rivers.

BRIDGES.

The proposed bridge for the new road over the Delaware at the Delaware Water Gap will be 950 feet long.

Hopkins & Co., St. Louis, have the contract to build the two Wabash Ry. bridges over the Des Moines River.

Governor Cornell has signed the bill authorizing Warsaw to borrow money for the purpose of building a bridge over the Vernon Kill.

The Toronto Bridge Co. are building the bridges of the Canada & Atlantic Ry., between Coteau Landing and Alexandria. They are iron and steel structures.

The citizens of Edwardsport, Ind., will present to the board of commissioners, at their next term, a petition for an appropriation for a bridge across White River at that place.

The Builders' Iron Foundry, of Providence, R. I., have the contract for the cast-iron cylinders, 6 and 8 feet in diameter, 658 feet in all of lineal measure, for the Atchafalaya River bridge on the New Orleans & Pacific R.R. The 8-foot are $39 per foot, and the 6-foot are $27 per foot. The Delamater Iron-Works, of New York, have the same length of wrought-iron columns, same diameters, at $27 for the 8-foot, and $20 for the 6-foot. The wrought-iron is ⅝-in. plate; plain riveted and caulked 8-foot columns are $37 per foot, and those not caulked $25 per foot; the 6-foot are $20 and $19 respectively. Contract is with the American Railway Improvement Company.

RAILROADS.

The Supreme Court of Missouri has just given an important decision regarding the expiration of limited railroad tickets. The Court holds that passengers traveling on scalped and limited railroad tickets have rights that the law sustains. J. M. Evans, a colored man, bought of a scalper at St. Louis a limited ticket to Little Rock, Ark., for which he paid $9, $5.35 less than tariff rate. Evans boarded his train at 9 o'clock in the evening, and the conductor told him that the limitation of the ticket would expire at midnight, and at that hour applied to Evans for his fare. He offered all the money he had to be allowed to ride till morning, but the money, $1.75, was refused, and he was put off in the woods. In groping around in the dark he fell into a cattle-guard and received severe injuries, for which he sued that company, laying his damages at $1,000. The Court held that the ticket was good for the point indicated if presented on the train before the limitation expired. The jury gave a verdict of $350.

NEW PROJECTS.

The Galveston & Pacific Narrow-Gauge Railway Company has organized the route of the road from Galveston to Victoria, San Antonio and Camargo.

Gen J. S. Casement states that the right of way for the New York, Chicago & St. Louis road has been secured through New York, Pennsylvania and Ohio; that immense quantities of ties are being delivered from Alpena, Mich., and the road-bed will be ready for the rails in September.

A. P. Gatch, Theo. Comstock, George A. McKay, E. Barcus and L. C. Freeman have formed the Columbus & Cincinnati Railroad Company, with termini at Columbus and Lebanon. Capital, $1,000,000. The road passes through Franklin, Pickaway, Madison, Greene, Clinton and Warren Counties.

NEW YORK, May 26.—The Continental Construction & Improvement Company organized at the office of Hatch & Foote to-day. The full capital stock of $10,000,000 has been subscribed, and 20 per cent. premium was offered to-day as subscriptions. The company will build the Boston, Hoosac Tunnel and Western Railroad, which will establish a new line from Boston to Buffalo. The Hoosac Tunnel road extends from North Adams to Schenectady. The route will be thence *via* Utica, Syracuse and Rochester to Buffalo, utilizing the Syracuse & Chenango road, lately purchased by the Burt Syndicate. A branch will be built into the soft coal regions; also a branch to Oswego. Arrangements have also been made for a line to New York. The enterprise is in very strong hands. Some of the best railroad men in the country are identified with the scheme. The subscribers include several of the strongest banking houses in the city. The negotiations have been conducted with remarkable skill, and the enterprise bids fair to be one of the most successful of the year.

THE LABOR MARKET.—In consequence of the scarcity of hands and abundance of work wages have gone up, so that carpenters receive from $2.50 to $3.50 per day, and bricklayers from $3.00 to $4.00 per day. Teamsters get $3.00 per day on all work in the city, and those working on the railroads receive $3.50. Common laborers receive from $1.50 to $2.00 per day, according to the nature of the work. The railroads now being built in the State offer and widely advertise for workmen, shovelers, diggers, etc., at $1.75 per day. In truth railroad agents are using their utmost endeavors to find men and engage them at the above figures. It was only Monday last that the reporter stood on the platform at the Rock Island depot and heard the attempt made to persuade the Swede imigrants, bound for Avoca, to accept work at that price and free transportation to the field of work. The request was made, too for all that could work to come and plenty for all to do was guaranteed. Farm hands too, are scarce, and receive better wages than for many years. All kinds of such hands receive from $18 to $22 per month and their board, and the best ones get from $1 to $1.25 per day and their board. The healthy state of affairs makes it possible for any man who is willing to work to get employment at good living wages. And there is no probability of the employment or wages stopping until the severity of the next winter's weather causes a cessation of out-door work, and even then it is believed that there will be much more building under way than can be finished during the cold days of next winter, of inside work, etc.—*Des Moines Register.*

CONTRACTING, MISCELLANEOUS, ETC.

The Phœnix Iron Co., of Philadelphia, have the contract for the iron beams for the new Government building at Albany. The bids for the iron work of the roof of the building were opened at Washington on Wednesday, the 25th ult., and were as follows:

James McKinney, Albany, N. Y.	$20,984
Phœnix Iron Co., Trenton, N. J.	24,500
Sullivan & Rice, Albany, N. Y.	24,765
Dwight & Co.	24,900
Steward & Stevens, Philadelphia.	29,681
Phœnix Iron Co., Philadelphia.	30,900
Bartlett, Haywood & Co	34,750

The contract was awarded to James McKinney, of Albany.

A farmer residing near Indianapolis gave a novel entertainment the other day. He had been wrestling for a few weeks with stumps on a newly-cleared farm. Becoming tired of the work, he conceived the idea of using dynamite on a large scale. A few days ago he invited his neighbors to witness the simultaneous blowing out of forty acres of stumps. Holes had been drilled and cartridges inserted in every stump, and the cartridges connected by wires with an electric battery. On the word being given, the electric current was put on. The work of explosion was satisfactory, every stump being blown to atoms. Some of the fragments were driven three hundred feet. This simultaneous process might be of great advantage in such work as the running of a railroad through a new country, or in any other work in which time is of great consequence. The liability to accident would be less if the dynamite were used in this way than if many small explosives were used.